LEADERSHIP TRAINING: KNOWLEDGE DEVELOPMENT

MODULE 1

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Acknowledgments

The information presented in this module consists of selections from the sources below, used with the permission of the authors. (Specific references cited therein are listed at the end of this module.)

United Nations Environment Programme (UNEP) - Caribbean Environment Programme (CEP). "Training of Trainers Course in Marine Protected Areas Management", modules 1-8. 2005.

OVERVIEW

Marine Protected Area (MPA) management requires mastery of wide range of complex and ever-changing information, including scientific, legal, resource management and sociological information.

The marine environment is extremely diverse, encompassing a wide variety of different marine ecosystems and habitats, such as coral reefs, mangroves, seagrasses, and many others. These marine habitats provide a variety of uses to humans, including food, recreation, and waste management. They are also continually threatened by various pressures, including environmental changes, overexploitation by humans, and pollution from terrestrial sources. The main challenge for coastal management is to balance multiple human needs and uses of the marine environment sustainably, while striving to minimize the human-caused pressures.

Enforcing and managing a MPA for the ultimate goal of sustainability involves navigating a wide variety of local, national, and international regulations. Interpretation and enforcement of these regulations is made additionally challenging by the different goals and priorities of various stakeholders (local fisher people, tourism industry, commercial fisheries, mariculture operations, etc.) It is essential to understand the points of view of these stakeholders and to include them in the planning and enforcement process.

Module 1 is designed to help you review and expand your knowledge of marine ecology, pressures that affect various marine habitats, relevant laws, and the roles of different stakeholders. This knowledge base will facilitate your development as a well-informed leader and mentor for other MPA managers and colleagues.

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IMPORTANCE OF KNOWLEDGE DEVELOPMENT

A MPA manager who has mastered the essential knowledge base of marine biology, ecology, legal issues, and sociology, can become an effective mentor for other MPA staff and managers. A mentor also needs to have a firm grasp of local, regional and transboundary issues. Knowledge of local habitats, laws, stakeholders, and the specific resource management issues that are of concern locally is crucial.

LEARNING OBJECTIVES

- ✓ To review and expand knowledge of basic marine science, ecology, and the uses and vulnerabilities of marine habitats and ecosystems.
- ✓ To learn about the specific laws and regulations relevant to MPA management in Southeast Asia.

- ✓ To gain an appreciation of the different perspectives of stakeholders in Southeast Asia.

INDICATORS OF EFFECTIVE KNOWLEDGE

A MPA mentor should have a good working knowledge of the characteristics of different marine and coastal ecosystems and habitats, why they occur where they do, interactions between ecosystems, what uses they provide to humans, and what environmental and anthropogenic threats affect these areas. Additionally, in order to effectively track and address resource management issues, it is important to have familiarity with relevant laws and regulations that affect MPA management, and the roles and perspectives of different stakeholders. As a mentor, it is important to be able to draw on this knowledge base to help guide staff from other MPAs while addressing both common and site-specific resource management issues.

Long-term indicators of effective leadership skills:
An effective MPA mentor will:

- ✓ Be able to initiate research or monitoring programs to track new and emerging issues
- ✓ Regularly share new information and ideas with colleagues.
- ✓ Develop a grasp of these issues not only locally but also nationally and internationally, so that the mentor can advise colleagues within their MPA network.

LESSON PLAN

1.1 INTRODUCTIONS & OVERVIEW

The participants in this section of the MPA Management Capacity Training course will work together for four days to discuss and learn more about mentorship for and leadership of MPA managers. During this time, we will enhance our knowledge of marine and coastal ecology, legal issues, and sociological issues, and we will learn effective facilitation and training methods that can be used to assist and mentor colleagues in their roles as MPA resource managers.

We will start with some exercises to get to know each other, and to find out what we already know and what we wish to learn.

Exercise 1.1 - Let's Talk

- Walk freely around the room, avoiding physical contact.
- At a sign from the teacher (e.g., hand-clap), find a partner.
- Find out two or three facts about your partner (e.g. birthday, likes and dislikes, hobbies). Listen carefully to each other.
- Answer the questions from your partner with full sentences. (Avoid "yes" and "no" answers.)
- At a sign from the teacher, all partners come together in a large circle. Going around the circle, each person will introduce his or her partner to the group, using a few of the facts just learned.

Exercise 1.2 - Introductions and Goals

Go around the circle. This time, each person will once again introduce themselves by name, and answer the follow two questions:

- *What are your goals for this course?*
- *Who are your marine conservation heroes, and what leadership qualities do they possess?*

Exercise 1.3 - What do we know already, and what do we want to learn?

Group discussion on the following questions:

- *What are your leadership roles and responsibilities now?*
- *What do you wish your leadership roles & responsibilities to be after this course?*
- *Do MPA managers in Southeast Asia currently have the information and the support that they need to do the best job? If not, what do they need?*
- *How well-informed do you feel about marine biology, law, and local fisheries issues?*
- *Do you have all the information and skills that you wish you had, to do the best job? How do you currently seek out new information?*
- *What further information and skills do you want to develop to become a more effective leader - a leader for your colleagues, for stakeholders, and for the general public?*

1.2 COASTAL AND MARINE HABITATS

Introduction to the Marine Environment

Though seawater covers approximately 71% of the earth's surface (Tait, 1981), the marine environment is not one uniform body of water. It encompasses many different sub-environments ranging from the cold, dark ocean depths to the well-lit surfaces that are well-mixed through wave action, and from the open ocean to the highly variable transition zone between land and sea. The major variables that determine where marine organisms live and the ecological characteristics of the different zones are: light, depth, temperature, currents, wave action, nutrients, chemical composition, and proximity to land. Depending on the particular mix of these influences at a certain place, various different communities and habitats can develop, including:

- coastal forests;
- coastal scrub communities;
- beaches;
- wetlands (freshwater and saltwater);
- rocky shorelines;
- seagrass beds;
- coral reefs;
- benthic (bottom-dwelling) communities; and
- the open ocean.

Coastal zones

The area of the land-sea interface commonly referred to as the coastal zone is actually made up of three divisions; (1) land, (2) the littoral or inter-tidal zone (that is periodically covered by water), and (3) the sub-littoral zone (extending from the inter-tidal zone to the edge of the submarine shelf). All of these zones have great variability, influenced especially by;

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- type of shoreline (rocky, beach, etc.);
- variation in the tidal changes;
- drainage (dry vs. rainy);
- configuration and complexity of the coastline (open, bay, etc.);
- topography (absence or presence of wide plains);
- absence or presence of a coastal shelf, and the variability in ocean depth leading from it to the shoreline;
- season (winter vs. summer);
- rainfall pattern.

These factors determine the physical conditions of that particular coastal area, and therefore the suitability of the area for colonization by particular groupings of plants and animals.

A variety of inputs to the nearshore environment resulting from human activities are superimposed on this natural variation. Human activities not only add to the effects of a number of the environmental variables; they also add new factors, such as chemical and solid waste pollutants and sewage and agricultural nutrients. In addition to changing the variability of the nearshore environment, human activities also directly affect the natural functions of these coastal ecosystems.

These coastal habitats are all connected. They are connected by the movement of water, by land to sea (terrestrial influence) and by open ocean to land (oceanic influence). They are also connected in numerous other ways, particularly the movements of organisms and materials between them. Examples:

- wetlands and seagrass beds provide a nursery function for species of marine fauna;
- coastal wetlands trap sediments and reduce concentrations of nutrients and pollutants before these reach the marine environment;
- wetland communities and seagrass beds export nutrients to nearby coral reefs;
- coral reef systems protect some nearshore communities;
- certain marine fauna (corals, fish, etc.) are recruited from upstream areas (some occurring hundreds of miles away).

Characteristics of Some Coastal Habitats

The following coastal habitats are of particular relevance to many MPAs in Southeast Asia.

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Estuaries & Lagoons

Estuaries and lagoons are shallow, semi-enclosed bodies of water with variable salinity, often with soft-bottom mudflats. They are very productive and support many specialized fisheries, including fishes that breed or nurse in lagoons & mangrove areas; crustaceans and mollusks that live in soft bottoms; and species tolerant of varying salinity, such as milkfish, tilapia, and shrimp.

Mangrove Forests

Mangrove forests were formerly considered as wasteland and were often cleared and converted to other, less productive, uses. However, one hectare of healthy mangrove forest can supply many resources directly (wood, fish, and crustaceans), and it is now known that mangroves *support many food chains that extend out into other habitats*. One hectare of mangrove forest supports about one ton of fish per year. Important fisheries associated with mangrove ecosystems include shrimps that depend on mangroves for nursery and feeding areas; crabs that feed on mangrove detritus; mollusks that filter-feed on mangrove nutrients; many fish species that feed on these animals; and these fishes in turn provide food for larger fish species in nearby estuaries and in open water. Many reef and coastal fish species use mangrove forests as nurseries. Mangrove forests that surround aquaculture can *filter many aquaculture wastes*.

Finally, mangrove forests absorb storm surges, protecting areas behind the forest during large storms.

Coral Reefs

Coral reefs are extremely efficient at capturing nutrients and sunlight, and produce *the highest fish yields of any habitat in the world*, per unit area. A single Southeast Asian coral reef can produce about 20 t/km^2/year of usable fish. They are also extremely delicate and are *particularly vulnerable to physical damage*, such as from fishing gear, recreational boats, and trawling. They often occur in association with other habitats, particularly seagrass beds and mangrove forests that provide nursery and feeding areas for many reef creatures. Coral reefs support an extraordinary number of economically important species, including over 1,000 species of fishes; giant clams and other bivalves; lobsters, crabs and shrimps; a variety of small organisms including sea cucumbers, sea urchins, sponges, seaweeds and many snail shells; and large animals such as mackerel, sea turtles, manta rays and dugongs that feed over the reefs.

Exercise 1.4 — Exploring the Natural History of the Channel Islands Sanctuary

We will be using GIS as a tool to explore and understand the biology, geology, typography and uses of an MPA.

1.3 USES AND THREATS TO THE MARINE ENVIRONMENT

The marine environment provides a range of goods and services that are used by human beings for a variety of purposes, the most obvious of which is as a source of food. Coastal habitats often act as a natural filter, as well as important storm protection. The marine environment can be said to be a **Source** of benefits to humans. Unfortunately, human beings often use the marine environment as a means for disposal of their wastes; sewage, industrial effluents, and even (in the recent past) hazardous materials. Additionally, substantial amounts of inorganic, organic, and man-made materials that are found naturally on land, or deposited by humans, eventually find their way to the marine environment. Even gaseous byproducts that are emitted to the atmosphere are eventually deposited in the marine environment, directly or indirectly through streams and rivers. For these reasons the marine environment can also be said to be a **Sink.** In this regard, it has been suggested that coral reefs function as global sinks for carbon dioxide, and their management should be accorded the same level of importance as tropical forests.

Exercise 1.5 - Uses of and Threats to Marine Environment

As the teacher presents the following information on the uses and threats to the marine environment, keep a sheet of paper handy and list specific examples that come to mind from your own area. At the end of the presentation, look at your list. Are there any uses, or any threats, that are not a factor in your area? Are there any that are particularly severe? Discuss your list with the whole group.

Uses of the Marine Environment

The goods and services provided by the marine environment include:

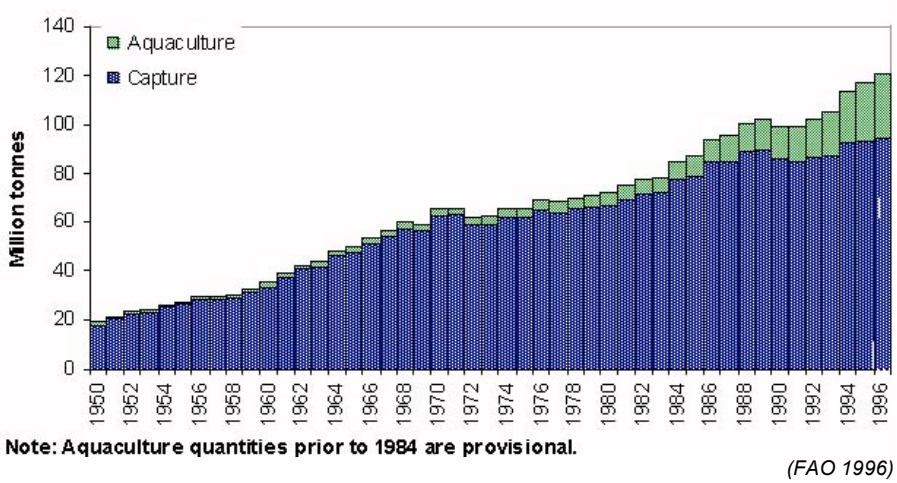
Food

Of the 99.5 metric tons of finfish and shellfish caught in 1989, 86% (85.8 metric tons) came from the marine environment, with the remainder from inland waters (FAO, 1991). It is believed that,

"...the catch of finfish and shellfish is the world's largest single source of animal protein, exceeding production of beef, sheep, poultry, or eggs" (Norse, 1993; P. 17).

As the fisheries become over-exploited, more attention is being paid to mariculture as a means of maintaining marine fisheries production levels. Additionally, there has been a significant increase in the collection (from natural stocks) and cultivation of seaweeds.

Total World Fisheries Capture and Aquaculture, 1990-1996



Note: Aquaculture quantities prior to 1984 are provisional.

(FAO 1996)

Medicine

Though medicines from plants and animals have historically been derived primarily from land sources, the discovery of anti-viral and anti-tumor agents from marine organisms has spurred greater interest in the potential of marine organisms for medical research. The sea is such a rich source of materials for use in medical research because of the diversity of organisms, in form, function, and biochemical makeup. Norse (1993) states that of the 33 animal phyla, 32 occur in the sea, and 15 are exclusively marine.

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Raw Materials

In addition to medicines and foods consumed directly, the marine environment provides a number of products that are used as raw materials for a variety of purposes. These include:

- Seaweeds, such as alginate/carrageenan/agar (for use in food and medical applications);
- Fertilizer;
- Animal feed;
- Coraline materials, such as coral skeleton (jewelry, building material);
- Sand (beach nourishment, construction material for buildings and roads); and
- Chitin from crustaceans (agricultural, medical, cosmetic, and wastewater applications).

Services

In spite of the provision of a wide range of goods for consumption and as raw materials, the most significant contribution of the marine environment is in the form of ecosystem services. Such services include:

- Coastal protection provided by mangroves, seagrass beds, & coral reefs;
- Transportation of cargo & passengers;
- Stabilization of global climate (control of carbon dioxide concentration in the atmosphere by phytoplankton at the oceans' surface);
- Recreational/amenity uses - tourism, etc.; and
- Waste treatment and disposal.

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Handout 1.1: Natural & Economic Functions of Selected Ecosystems

Threats to the Marine Environment

Environmental events

Environmental events can affect marine habitats directly, through:

- High temperature (coral bleaching);
- Flood events (transport large volumes of fresh water and sediments from land to the marine environment);
- Storms (structural damage);
- Sea level rise; and
- Disease (may also be induced by some human activities, such as pollution).

These events can cause damage to coral reefs as well as other habitats; including beaches, seagrass beds, and mangrove stands. Additionally, the impact of one event can increase the vulnerability of the resource to a different threat, or even act as the trigger for the other. For example, the damage caused to corals by disease may increase the susceptibility of the coral reefs to hurricane damage, as well as contributing to post-hurricane mortality. Woodley (1999) suggests that coral diseases may also thrive when the corals are already weakened by other stresses.

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Global warming is one phenomenon that is projected to increase the frequency and intensity of some natural events, and may eventually change the weather patterns over large areas of the planet. The destruction of the (stratospheric) ozone layer may create a much larger problem. As Norse (1993) states, "*A major increase in ultraviolet radiation at the sea surface due to the depletion of stratospheric ozone could disrupt the sea's food webs on a scale dwarfing anything in human history*."

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Overexploitation by humans

Overexploitation by humans is widely regarded as one of the greatest threats to many marine habitats. Specific issues include:

- Significantly high levels of by-catch (non-targeted species), which are often subsequently discarded;
- Destruction of habitats during the harvesting process (trawling for shrimp, dynamiting and chemicals for reef fish, etc.);
- Management of fisheries on a single-species basis;
- Inadequate enforcement capability;
- Inadequate protection of critical spawning/recruitment areas.

Coastal Development

Coastal marine habitats, as opposed to open-ocean and benthic (ocean floor) habitats, are also vulnerable to problems associated with coastal development:

- Construction of harbor facilities (damage or loss of habitat, suspension of sediments, loss of sessile organisms, alteration of current patterns in locale, etc.);
- Construction of shore protection structures (alteration of sand, movement resulting in erosion, alteration of currents in locale, etc.);
- Dredge and fill (loss of sessile (stationary) organisms, destruction or loss of habitats, transportation of sediments to sensitive marine ecosystems);
- Drainage of wetlands (damage to wetland, reduced productivity, loss of important species, transportation of sediments to sensitive marine ecosystems);
- Road and infrastructure construction (disruption of ecosystem functioning, loss of habitat, transportation of sediments to sensitive marine ecosystems);

- Construction of residential, resort, commercial, and industrial developments (loss of resources and habitats, transportation of sediments to sensitive marine ecosystems).

In addition to the direct impact of these activities, studies have shown that these land-based activities can lead to greater impacts by storms on nearshore coral reefs (Nowlis, et al, 1997).

Land-based Pollution

In nations without strictly enforced pollution and sewage-treatment regulations, land-based sources of pollution (point and non-point sources) form a highly significant threat to the marine environment. The main sources have generally been identified as the following:

1. Point sources (industrial, sewage, and solid waste);
2. Urban non-point runoff (stormwater runoff and combined overflow discharges);
3. Non-urban non-point runoff (cropland, pastureland, and forestland runoff);
4. Upstream sources (pollutants carried into the coastal zone as part of a river's streamflow);
5. Irrigation return flows (irrigation water return to lake, stream, or canal).

Though the pollution inputs from land-based sources have not been fully quantified, the impacts on the nearshore and marine environment are well known; encompassing degradation and destruction of the nearshore habitats, reducing bathing water quality (sometimes resulting in the temporary or permanent closure of bathing beaches), and generally creating public health hazards (UNEP, 1987).

Handout 1.2: Non-Point Sources of Pollution

Probably more problematic than the point sources of pollution are the non-point sources. Mounting volumes of solid waste overwhelm collection and disposal systems, and dumps and landfills often produce *leachate* (contaminated water that has filtered through waste or hazardous material). This contaminates the coastal ground water and the marine environment. Other non-point sources of pollution include agricultural and urban runoff. These inputs to the marine environment are significant, and because they are widely dispersed, often difficult to address.

Activities taking place in the watersheds produce significant negative impacts on the marine environment. The watershed-generated inputs are transported to the marine environment via large river systems, and may be transported "*…from as far distant as the Andes and the northern Great Plains of North America*…" (UNEP, 1989, P. 27).

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Maritime Activity

Shipping and maritime activities also contribute to the degradation of the marine environment through docking operations, ballast water and tank washing, harbor operations, and oil spills from exploration, production, and shipping. Cruise tourism, one of the beneficiaries of a pristine environment, also contributes to the problem, through the disposal of solid and sewage wastes.

Exercise 1.6: Non-point Source Pollution— Following a Drop of Rain

You will use a GIS-based exercise to track storm water pollution, following a drop of rain through a complex watershed to the marine environment.

Sustainable Development: Balancing the Uses and Threats

The great challenge of marine habitat management is to balance the uses and threats outlined above - i.e., enable humans to use the marine habitat without destroying it**.** This goal is ***SUSTAINABLE DEVELOPMENT***. Sustainable development is most often defined as a form of development that, in the words of the Report of the World Commission on Environment and Development (Brundtland Report), meets the needs of present generations without compromising the ability of future generations to meet their own needs. This definition lacks the element of progress or improvement that the word development implies. A definition incorporating this element of improvement might be,

"**a process of development that allows for the improvement of the quality of human lives while maintaining and enhancing the resource base upon which life depends"**.

Such a process is extremely challenging, as it requires simultaneous attention to social, environmental, and economic objectives. Such goals are sometimes incompatible with one another, requiring difficult decisions and trade-offs.

Given that an important purpose of protected areas is to maintain the resource base, they can logically play an important role in strategies for sustainable development. To do so, however, they must acknowledge and incorporate the social and economic sides of sustainable development.

In many tropical areas, non-sustainable forms of development have long been the norm. The impacts have included the collapse of nearshore fisheries; coastal erosion; pollution; population congestion; conflicts of use; and loss of critical habitats including coral reefs, mangroves, and seagrass beds.

1.4 TRACKING NEW & EMERGING ISSUES IN SE ASIA

The Role of Communication in Tracking New & Emerging Issues

Marine Protected Area (MPA) management must always be alert for the development of new and unforeseen issues. These issues may arise gradually or suddenly; they may first appear within the MPA, nearby, or in other regions. Emerging issues may include activities that are currently unforeseen, but may come up in the future due to technological advances, changes in operations, changes in market demand, and increased pressures on the coast. They include:

1. Issues which are currently considered to have relatively small impacts, but which *may grow* to have large impacts in the future;
2. Activities which may be occurring in *similar environments*, but not actually in the sanctuary;
3. Activities that are based on *new technology* whose potential impacts are not well understood.

Effective and clear *communication* can help pinpoint these issues as soon as they emerge, allowing early development of response strategies. Maintenance of an information database, typically an electronic *web-based cataloging system*, can be effective in capturing information from many sources and making it available to all interested parties. Web catalogs function as follows:

1. Information (specific to new & emerging issues in the marine environment) is gathered from:
   - Interactions with other resources management agencies (other MPAs, etc.)
   - Meetings with advisory councils
   - Scientific and conservation workshops, conferences, and symposia
   - News clips
   - Any other relevant meetings, conferences, situation reports, etc.
2. A staff person is assigned to maintain the system and send out reminders to the staff to use the system.
3. If and when highly relevant new and emerging issues surface, the staff maintaining the system will send out electronic messages to the staff to inform and exchange information.

An evaluation system should be established for determining whether a specific issue is relevant to the MPA. Topics to evaluate include:

- What is the general description and current status of the activity?
- Who are the responsible parties or potential user groups involved in the activity?
- Have any precedents been set for this type of activity?
- Are any other MPAs addressing this issue?

- Are any other resource management agencies dealing with this issue? If so, how are they addressing the issue?
- What are the potential impacts to MPA resources?
- Might this activity be in violation of any relevant regulations?
- Are there activities with similar impacts already occurring in the MPA which establish precedent for an exception, either from a regulatory or permitting standpoint?
- If there are similar activities that the MPA is already allowing exception for or permitting, are the impacts from this activity less or greater than for the new/emerging issue?
- Would the current permitting authority allow this activity to be permitted? Under which kind of permit?
- Are there other agencies who should be involved in working on this issue?
- Have local or regional headquarters been involved in dealing with this issue?
- Does this issue warrant national policy development?
- What future implications might there be for other sites?
- What are the next steps for addressing this issue? (propose regulatory action, permit, education, work group, research, etc.)?

The Role of Research for Detection of New & Emerging Issues

Research within a MPA is essential for good management and stewardship. At the initial stages of MPA designation and the development of the management plan, research can provide environmental managers with a rationale for setting standards and giving predictive models for the selection of management strategies.

After implementation of the management plan, research will assist administrators by monitoring the health of the marine resources, the extent of human uses of the area, and the impacts produced by humans on the resources. This information is essential for regulating and perhaps limiting use, and for detecting new and emerging issues of concern.

Research programs may perform some of the following functions:

- Inventory the marine resources that exist in the MPA;
- Observe and evaluate impacts (anthropogenic and natural);
- Determine uses and threats to MPA resources;
- Obtain fundamental scientific knowledge;
- Determine changes in the health of the resources, as well as changing uses;
- Evaluate compliance with regulations;
- Offer early warning signals of problems;
- Provide a link to broader research efforts outside the MPA; and
- Offer solutions to issues and problems in the management of the MPA.

Resource Inventories & Baseline Research

Baseline inventories are essential for the development of the MPA management plan and establishment of regulations for use of the MPA resources.

Without knowledge of the existing resources and current human use of them, detection of any changes is impossible. Imposing regulations is also impossible.

Ideally, baseline information should be obtained prior to establishment of the MPA, and at the beginning of implementation of management strategies, in order to determine initial conditions. Subsequent changes in physical parameters, ecological data, or human uses can then be compared to the baseline data.

The most basic information focuses on the existing flora and fauna and involves resource inventories to determine what species are present and how their distributions vary in space and time. Researchers should focus on the ecologically dominant species, as well as species that are endangered, threatened, or of key ecological interest. They must also assess the ecological relationships between species, populations, and communities. Research should also address the essential physical requirements of the important ecosystems of the MPA (water quality, habitat requirements, food and nutrients). Baseline research should also quantify human activities outside the MPA which could have an impact on MPA resources (water pollution, habitat destruction, coastal development, forestry, hunting and fishing), as well as activities inside the MPA (boating and maritime transportation, fishing, diving). Managers should search the scientific literature and archives of government agencies for existing data and current or past monitoring efforts. This often will economize limited resources.

Ecosystem Monitoring

Continual, long-term, statistically valid monitoring in the MPA should measure the health, abundance, and distribution of marine resources over time (Agardy, 1997). Trends in these parameters may suggest new management strategies. MPA administrators should consider innovative approaches that involve continuous monitoring and gathering of data by volunteers, students, or members of the local community. This continuous monitoring permits analysis of changes caused by natural environmental variability and/or user impacts.

User Monitoring

Any MPA management plan cannot proceed without good information on the types and levels of human interventions in the MPA, such as by fisher people, tourists & divers, boats, mangrove users, research scientists, etc. This is important in order to subsequently assess the impacts that they cause on the marine resources, the conflicts that may arise between uses, and the levels of visitor and user satisfaction with the management strategies and quality of the resource base. It

can also be used to define a *carrying capacity* for the MPA - e.g., how many divers or fisher people per year a coral reef can support without being negatively impacted.

Social, Political, and Legal Issues

Most of the problems the MPA managers face are social and political. These concern the relationship of people and the marine and coastal resources of the protected area. The central nature of these questions suggests that MPA managers and research coordinators should give priority attention to social and economic research programs. At a minimum, MPA managers must find practical methods to monitor human uses of the MPA, as well as economic and social impacts of the MPA.

Economic research can analyze the economic impact (costs and benefits) of the MPA establishment and operation. For example, MPA managers might analyze the jobs and income opportunities which are created or lost in local communities because of the MPA. The MPA administrators might elect to compensate the "losers" in some manner. The economic valuation of the contributions of MPAs to society can also be important when decision-makers determine whether to establish a MPA, list the goals of the MPA, and grant sufficient funding for implementation of effective management strategies.

Sociological research may examine the perceptions of resource users, residents of local communities, the general public, and national agencies regarding the purpose and goals of the MPA. This type of research will indicate to managers how gender, economic and social class, and user interest relate to the concerns, views, and expectations about the MPA. Other studies might assess the user (tourist/diver) satisfaction with the MPA experience, the source and development of conflicts, and compliance/enforcement of MPA regulations.

Cultural research studies the organizational structure of communities and cultures (traditional and non-traditional) that are adjacent to or within the boundaries of the MPA. Information that will be of direct use to MPA managers includes: marine property rights systems of the local community, the importance of marine resources for community well-being and stability, and the traditional and non-traditional techniques developed by local users to conserve and exploit marine resources. The establishment of a marine reserve/MPA may cause change in the community and its ability to exploit marine resources, and the MPA manager should be aware of the impacts for which he/she and the MPA policies are responsible.

Political science research can be important both during the establishment of the MPA, as well as during the operational phase. MPA managers need to be aware of the division of governmental functions inside and outside the MPA among different agencies at different levels of government. This will indicate where possible conflict among agencies may occur and where competence is shared or repeated among various agencies. Analyses of the power and decision-

making centers in the local community and at the national level can suggest the individuals or institutions that MPA administrators must approach to obtain enhanced support for MPA plans, funding, and operations. An understanding of local pressure groups and interests is essential for resolving the conflicts that inevitably arise among different user groups or between different user groups and agencies

Legal research at both the national and international levels is necessary to clarify what legislation or regulatory basis exists for MPA management strategies, as well as possible overlaps or gaps in responsibility between various institutions. The growing body of international and regional environmental conventions and protocols may present the MPA manager with additional responsibilities, as well as opportunities for action and international cooperation that support research and management. Legal analyses can also evaluate the effectiveness of the legal basis for the MPA in question and suggest revisions that may facilitate effective management strategies.

Planning and Budgeting for Research

MPA managers must develop a research and monitoring plan before any research begins. This must be an open process with input from resource users, members of local communities, MPA personnel, personnel from related government agencies, and social and natural scientists. The research planning body must identify and prioritize research needs that clearly respond to the needs of management and the relevant management philosophy.

The actual research and monitoring program will usually be limited by funding or personnel. Therefore, it is important to develop priorities and at least collect the information that is most critical for successful management. Even very low-budget research can be very informative if it is planned carefully and executed consistently.

Exercise 1.7 - Planning a Research Program

Working in small groups of 4-6 people, select a real MPA that at least one member of the group is highly familiar with. First, discuss any research programs that already exist in that MPA. Then, working from the above list, decide which three research areas (e.g., ecosystem monitoring, user monitoring, legal research) should be highest priority for this MPA, and design a practical research program.

EXERCISE 1.8: Anticipating a Jellyfish Invasion Before it Hits

Group exercise to design a regional MPA network communication plan to build a partnership to address new and emerging issues, using a jellyfish invasion as an example/case study.

1.5 COASTAL AND MARINE POLICY: LAWS AND REGULATIONS

Protected Areas

The establishment of protected areas is one of the strategies used in the management of environmental resources. The following definition of a protected area was derived at the 4th World Congress on National Parks and Protected Areas, held in Caracas, Venezuela, February 1992:

Jessica Sanders 10/27/05 6:56 AM
Deleted: This is also a good bit of overlap with the concepts (other module 1) but never hurts to have a review!

A protected area is defined as "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means" (IUCN, 1994. P.7).

The main purposes for establishment and management of protected areas are:

- Scientific research;
- Wilderness protection;
- Preservation of species and genetic diversity;
- Maintenance of environmental services;
- Protection of specific natural and cultural features;
- Tourism and recreation;
- Education;
- Sustainable use of resources from natural ecosystems; and
- Maintenance of cultural and traditional attributes.

Protected areas have been grouped into the following six (6) categories (updated from the ten categories developed by IUCN in 1978):

Category I:	**Strict Nature Reserve/Wilderness Area** - area managed mainly for science or wilderness protection (includes two sub-categories; Strict Nature Reserve - Ia, and Wilderness Area - Ib).
Category II:	**National Park** - area managed for ecosystem protection and recreation
Category III:	**Natural Monument** - area managed mainly for conservation of specific natural features
Category IV:	**Habitat/Species Management Area** - area managed mainly for conservation through management intervention
Category V:	**Protected Landscape/Seascape** - area managed mainly for landscape/seascape conservation and recreation
Category VI:	**Managed Resource Protected Area** - area managed mainly for the sustainable use of natural systems

Marine protected areas can be developed under several of the categories, hence the familiar terms of fishery management area, fish sanctuary, fish reserve, marine park, etc.

The review of the system developed by IUCN in 1978 identified a number of pertinent issues, namely:

- The size of protected areas;
- Zoning within protected areas;
- Management responsibility;
- Ownership of land;
- Regional variations;
- Multiple classifications;
- The areas around protected areas; and
- International designations.

Laws and Regulations Relevant to MPAs in Southeast Asia

A guest speaker will discuss and describe the legal issues relevant to MPAs in Southeast Asia.

Exercise 1.9: Laws and Regulations in a Specific MPA

Working in small groups, select a MPA that at least one member of your group is highly familiar with. List all the laws and regulations that apply to this MPA or affect it in any way, including local, national, and international regulations that you have just heard about in the presentation.

- *How many different regulations have you listed?*
- *Do any of them conflict with each other?*
- *How many are not complied with or not enforced?*
- *How many conflict with MPA use patterns of the local population?*
- *Where could you go for more information about these laws and regulations?*

At the end of the exercise, share with the whole group the information you have about where to go, and who to talk to, to remain fully informed about existing laws and regulations that impact MPAs, and new regulations that are under consideration.

LITERATURE CITED

The information presented in this module consists of selections from UNEP used with the permission of the authors. References cited therein:

Awosika, L., S. Boromthanarat, R. Comforth, M. Hendry, R. Koudstall, M. Rigley, S. Sorenson, L. De Vrees, and S. Westmacott. 1993. *Management Arrangements for the Development and Implementation of Coastal Zone Management Programmes*. World Coast Conference Organising Committee. International Conference on Coastal Zone Management, The Netherlands, November 1-5, 1993.

FAO. 1991. *Statistics Series No. 68: Catches and Landings*. FAO, Rome.

FAO . 1996. Recent Trends in Global Fisheries Production.
Available from: http://www.fao.org/fi/trends/trends.asp

Gardner, Lloyd. 1999. *The Economics of Environmental Pollution*. Paper presented at the 5th Annual Virgin Islands Non-Point Source Pollution Conference. St. Thomas, U.S. Virgin Islands, May 19-20, 1999.

Norse, Elliot (Ed.). 1993. *Global Marine Biological Diversity: A Strategy for Building Conservation into Decision Making*. Island Press, Washington.

Nowlis, J.S., C.M. Roberts, A.H. Smith, and E. Siirila. 1997. 'Human-enhanced Impacts of a Tropical Storm on Nearshore Coral Reefs' in *Ambio*. Vol. 26 No. 8, Pages 515-521.

Tait, R.V. 1981. *Elements of Marine Ecology: An Introductory Course*. 3rd Edition. Butterworths, London.

Miller, Kenton. 1996. *Balancing the Scales: Guidelines for Increasing Biodiversity's Chances Through Bioregional Planning*. World Resources Institute.

UNEP. *Regional Overview of Land-Based Sources of Pollution in the Wider Caribbean Region*. CEP Technical Report No. 33. UNEP Caribbean Environment Programme, Kingston, 1994.

UNEP. *Regional Overview of Environmental Problems and Priorities Affecting the Coastal and Marine Resources of the Wider Caribbean*. CEP Technical Report No. 2. UNEP Caribbean Environment Programme, Kingston, 1989.

Woodley, Jeremy. 1999. *The Status of Jamaican Coral Reefs*. Unpublished.